CONSULTANT'S GUIDE

AIR QUALITY
PROJECT LEVEL ANALYSIS

Prepared by:

Douglas Landwehr
Air Quality Meteorologist

And

Amy Costello
Air Quality Manager

The Air, Noise and Energy Section, Environmental Division
Virginia Department of Transportation

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1.0 Introduction

This document provides basic information and standards for preparing an air quality analysis on a VDOT transportation project. One objective is to enhance the development and review of the scope of work and schedule of compensation proposals by standardization. Another objective is to communicate key expectations regarding the conduct of the air quality work and its product. This manual sets standards for air quality assessment work and should be consulted as a guide to avoid problems. The various parts of this guide conform to and improve upon the FHWA Guidelines.

2.0 Scope of Work

An example scope worksheet that outlines the required sub-tasks for an air quality study is provided in Appendix 1. The consultant's scope of work must detail work sub-tasks and cost estimates for performing the air quality work. They must be itemized and separate from all other work tasks (including those associated with noise and energy).

The work proposal must reflect a thorough understanding between the consultant and VDOT concerning the job tasks, all applicable environmental requirements, methods, models and timelines. All items must be addressed separately, as the example shows, in sufficient detail to facilitate a comprehensive review of the proposal by the Department Staff.

Worksheets will be submitted to the Department which present the following: man-hour estimates detailed by sub-task and personnel who will perform the sub-task; hourly salaries for each of the personnel involved in the analyses; itemization and details of direct cost; and timelines with definite schedule or dates for product deliverables. Include, but do not double-count, related preparation of traffic, text or reports, and plans to attend hearings. Separate itemization of the direct cost items (non-overhead items: trips, flights, lodging, meals, printing, etc) associated with air quality is required. These itemizations (tasks, salaries, direct costs, and timelines) are pre-requisite regardless whether the payment structure is fixed billable rates, cost plus net fee, lump sum, or other.

3.0 Modeling Protocol

Before VDOT will accept any air quality project level analysis, a modeling protocol for the project analysis must have been submitted and approved by VDOT Environmental Division Air Quality Section. The modeling protocol must include the following details:

1) Project description with project drawings
2) Traffic data
3) Proposed model and modeling parameters
4) Modeled Years – Base, interim and design
5) Receptor locations

The modeling protocol should comply with the standards outlined in 40 CFR 51 Appendix W "Guideline on Air Quality Models", EPA technical memorandum EPA-454/R-92-005 "Guideline for Modeling Carbon Monoxide from Roadway Intersections" and Section 5.0 Air Quality Project Level Analysis Methodology of this guidance.

VDOT Environmental Division Air Quality Section will provide approval or disapproval with comments of the modeling protocol within thirty (30) days of receipt of the protocol.

4.0 Approved Models

VDOT currently approves the use of the emission model MOBILE 6.2 and dispersion models CALINE3 and CAL3QHC. The requirements for use of these models is outlined as follows:

MOBILE 6.2 – The registration and 94+ LDG implementation data for the Hampton Roads, Richmond and Northern Virginia non-attainment areas should be obtained from the VDOT Air Quality Section. The parameters that should be used for modeling Carbon Monoxide (CO) emissions is as follows:

Parameter	Hampton Roads	Richmond	Northern VA	Other
Min/Max Temperature	$32^{o}F – 48^{o}F$	$28^{o}F – 45^{o}F$	$22^{o}F – 41^{o}F$	$30^{o}F – 40^{o}F$
Fuel RVP	6.8	6.8	6.8	6.8
Season	2	2	2	2
Absolute Humidity	75	75	75	75
Evaluation Month	1	1	1	1

Deviation of the parameters for MOBILE 6.2 from what is presented in these guidelines must be fully documented in the modeling protocol submitted for approval to the VDOT Environmental Division Air Quality Section.

CAL3QHC: The latest version of CAL3QHC available from EPA should be used for any modeling analysis. The parameters that should be used for modeling CO emissions is as follows:

Description	Value
Surface Roughness Coefficient	Urban - 175 centimeters, Rural – 11 centimeters
Background CO Concentration	1-Hour = 6 ppm, 8-Hour = 3 ppm
Wind Speed	1 meter/second
Stability Class	Urban – D, Rural – E
Mixing Height	1000 meters

Deviation of the parameters for CAL3QHC from what is presented in these guidelines must be fully documented in the modeling protocol submitted for approval to the VDOT Environmental Division Air Quality Section.

OTHER MODELS: Other models approved by FHWA and/or EPA will be considered on a case-by-case basis. All information pertaining to the model and modeling parameters must be included in the modeling protocol. VDOT will provide written notice of approval/disapproval for use of the model in the given project analysis.

5.0 Air Quality Project Level Analysis Methodology

All federally funded highway projects and any projects located in an air quality non-attainment or maintenance area should be reviewed early in the development process to determine the

appropriate level of air quality assessment. A memorandum of understanding was signed between VDOT and FHWA on August 9, 2004 which outlines when a quantitative or qualitative CO study is required. Based on the signed memorandum, the following guidance is provided so that the appropriate level of analysis for a project can be determined:

A. Projects that qualify for Programmatic Categorical Exclusions do not require a project level carbon monoxide air quality analysis

B. A qualitative carbon monoxide (CO) analysis, represented by a uniform statement, will be included in the Categorical Exclusion or Environmental Assessment for projects meeting one of the following criteria:

    a. Any project identified as being exempt in 40 CFR 93.126;

    b. Any project which meets the following design year level of service (LOS) requirements:

        i. LOS is "C" or better for all intersections/interchanges in the project area or intersections/interchanges directly affected by the project (40 CFR 93.123)

    c. Any project which meets the following traffic volume requirements:

        i. The design year 24-hour forecasted traffic does not exceed 30,000 vehicles per day if one or more intersections/interchanges has LOS "D" or worse;

        ii. The design year 24-hour forecasted traffic on any roadway in the project area, or any road directly affected by the project does not exceed 42,500 vehicles per day.

C. A quantitative CO analysis will be required on projects meeting one or more of the following criteria:

    a. Any project that does not meet any of the criteria under paragraph A or B above; or

    b. Any project for which an Environmental Impact Statement is prepared.

Unique projects such as a tunnel should be considered on a case-by-case basis to determine the appropriate level of air quality analysis. VDOT Environmental Division Air Quality personnel should be consulted to help determine the level of analysis for the project.

5.1 Qualitative Analysis

Based on the type of project, a qualitative analysis is a simple assessment of the project and documentation of why the project will not have a significant effect on air quality. The qualitative analysis can be documented in a technical memorandum that incorporates the standard language developed by VDOT and follows the following format:

1. Introduction – The introduction should include a brief synopsis of the project and pertinent history or information about the project.

2. Project Description – The project description should include a complete description of the project and any alternatives (including the No Build Alternative).

3. Existing Conditions – The existing condition section should include a discussion of the meteorology/climate associated with the study area, the current ambient concentrations of the studied pollutants, and discussion of current attainment status of the given air shed. Discuss the attainment/non-attainment/maintenance status (see Appendix 2) and any officially proposed or recommended classifications as well as the State Implementation Plan status including any pertinent information on future regional trends.

4. Regulatory Standards/Criteria – Discuss all relevant federal and local regulations and standards as they apply to the project.

5. Operational Emissions Analysis – Based on the criteria in the MOU between FHWA and VDOT, one of the following statements should be incorporated into this section:

   Exempt Project –

   According to 40 CFR 93.126 (Table 2 Exempt Projects), the project is identified as being exempt from an air quality analysis. Since the project is exempt from an air quality analysis, it can be concluded that the project will not significantly impact air quality nor will cause or contribute to an exceedance of the National Ambient Air Quality Standard for carbon monoxide.

   LOS Criteria –

   All of the intersections/interchanges in the project area or directly affected by the project are forecasted to operate at Level of Service (LOS) of "C" or better in the design year. According to 40 CFR 93.123, only a qualitative analysis must be conducted for this project, therefore, it can be reasonably concluded that this project will not significantly impact air quality nor will it cause or contribute to an exceedance of the National Ambient Air Quality Standard for carbon monoxide.

   Traffic Volume –

   The project does not include or directly affect any roadway whose design year daily traffic would exceed the traffic thresholds outlined in the Memorandum of Understanding (MOU) between the Virginia Department of Transportation and Federal Highway Administration for streamlining the project-level air quality analysis process. Modeling using "worst" case parameters has been conducted for these thresholds and it has been determined that projects below these thresholds, such as this one, would not significantly impact air quality nor will it cause or contribute to an exceedance of the National Ambient Air Quality Standard for carbon monoxide.

6. Construction Emissions Analysis – The following statement should be incorporated into this section depending if the project is located in an attainment area or not:

   Attainment

   The project is in an area that is classified as being in attainment with the National Ambient Air Quality Standards. The temporary air quality impacts from construction are not expected to be significant. Construction activities are to be performed in accordance with the Department's "Road and Bridge Specifications". The Specifications are approved as conforming with the SIP and require compliance with all applicable local, state and federal regulations.

Non-Attainment or Maintenance

The temporary air quality impacts from construction are not expected to be significant. Construction activities are to be performed in accordance with the Department's current "Road and Bridge Specifications". The Specifications are approved as conforming with the SIP and require compliance with all applicable local, state, and federal regulations.

7. Conformity – If applicable, the section should include the following statement with one of the other statements depending on the type of the project.

   The project is located in

   i. a non-attainment area for ozone and a maintenance are for carbon monoxide.

   ii. a non-attainment area for ozone

   iii. a maintenance area for ozone.

   iv. Early Action Compact area for ozone

   A) *Regionally Significant*

   The project is regionally significant and is not exempt from regional conformity requirements. It comes from the federally approved Year ???? Transportation Plan and the Fiscal Year ???? Transportation Improvement Program found to conform with the State Implementation Plan. The project completion schedule, design concept and scope are correctly reflected in the transportation plan and program.

   B) *Not Regionally Significant*

   The project is one of a class of projects that is exempt from regional emission requirements under conformity. This exempt category includes certain safety, and "neutral" de minimis projects whose air quality effects would not be detected by the regional emissions analysis for the transportation plans and programs.

   C) *Early Action Compact*

   Since the designation of attainment status has been delayed, the project does not need to conform to regional conformity requirements. However, if the status of the air basin should be designated then the project may be subject to conformity requirements.

8. Conclusion – The following statement should be incorporated into the memorandum:

   In conclusion, the project will not adversely affect the air quality of the study area. The project is in conformance with the current SIP and is not expected to interfere with the attainment and maintenance of the NAAQS.

5.2 Quantitative Analysis

A quantitative analysis must include a micro-scale air dispersion analysis following a protocol approved by VDOT Environmental Division Air Quality Section and using one (1) of the models outlined in Section 4.0 Approved Models or a model approved by VDOT Environmental

Division Air Quality Section. The air quality analysis must be fully documented in a stand alone technical report that follows the guidance outlined in this section.

Micro-Scale Air Dispersion Analysis

The quantitative analysis should be conducted using the default parameters outlined in Section 4.0 Approved Models. In addition, the following guidance should be followed while conducting the micro-scale air dispersion analysis:

1. Site Selection – For a project that includes intersections, the three (3) intersections with the lowest Level of Service (LOS) should be selected for the analysis. Selecting the lowest LOS intersections will ensure that the highest air quality impacts are modeled for the project. For a project that does not include intersections, reasonable CO maxima sites should be selected based on the details of the proposed plans, vehicle emission source strength factors, traffic, land use and the relative proximity of right of way boundaries to the road. Locations of special interest such as 4(f) parks, recreation or refuge areas, and 106 historic areas should also be determined, if any. The number of potential "final" analysis sites should be reduced down to those having the highest CO levels, with the possible exception of the 4(f) and 106 sites.
2. Receptor Location – The placement of receptors should follow the guidance outlined in EPA-454/R-92-005 "Guideline for Modeling Carbon Monoxide from Roadway Intersections". All receptors should be placed at minimum three (3) meters from the edge of the roadway and at a height of 1.8 meters. Reasonable receptor locations include the following:
    i. Sidewalks to which the general public have access
    ii. Vacant lots near an intersection
    iii. Parking lots including their entrances and exits
    iv. Property lines of all residences, hospitals, rest homes, schools, playgrounds, and the entrances and air intakes to all other buildings.
3. Averaging Period – The dispersion analysis should be conducted using a sixty (60) minute averaging period for the analysis. The eight (8) hour averaging period concentration should be derived by applying a persistence factor of 0.6 to the one (1) hour impact concentration. The persistence factor of 0.6 is based on the guidance in the *Manual for Air Quality Considerations in Environmental Documents* by the Federal Highway Administration Southern Resource Center, January 2001. If the derived eight (8) hour impact concentration is unrealistically high then a refined analysis can be conducted to determine the impact.
4. Traffic - One-hour traffic volumes, average operating speeds, percent hot-start, percent cold-start, and percent hot stabilized operation should conform to conditions for the peak one-hour with the highest traffic on adjacent roads. If a refined analysis of the eight-hour period is required then traffic volumes, average operating speeds, percent hot-start, percent cold-start, and percent hot stabilized operation should conform to conditions for the consecutive eight one-hour periods with the highest traffic volume.
5. Modeled Years – The project should be modeled for the base, interim and design year of the project and all of the alternatives (including the No Build Alternative).

6. Meteorology - "Worst case" assumptions for meteorology should include a 1 m/sec wind speed and a wind direction resulting in the highest CO concentration at each site. The worst case wind direction should be modeled by varying the wind direction in CAL3QHC by 5 degree increments. Stability "D" generally should be used for one-hour estimates. On projects situated in rural low density land-use areas, however, stability "E" should be used for a peak one hour. Stability "E" conditions do not prevail over peak eight-hour traffic periods even in rural situations. Therefore, when conducting a refined eight (8) hour analysis use stability "D".

Technical Report

The technical report must be a self-sufficient, comprehensive documentation of the air analysis. It should be prepared as a support document for reference by the text of the main environmental document. For an EIS project, the report must be provided specifically as an appendix to the EIS. The technical report should address the following in approximate order:

1. Introduction – The introduction should include a brief synopsis of the project and pertinent history or information about the project.
2. Project Description – The project description should include a complete description of the project and any alternatives (including the No Build Alternative).
3. Existing Conditions – The existing condition section should include a discussion of the meteorology/climate associated with the study area, the current ambient concentrations of the studied pollutants, and discussion of current attainment status of the given air shed. Discuss the attainment/non-attainment/maintenance status (see Appendix 2) and any officially proposed or recommended classifications as well as the State Implementation Plan status including any pertinent information on future regional trends.
4. Regulatory Standards/Criteria – Discuss all relevant federal and local regulations and standards as they apply to the project.
5. Operational Emission Analysis – Document the modeling methodology and results from the micro-scale air dispersion modeling analysis. The documentation should include the parameters used in the modeling, receptor locations (including maps and/or pictures), emission factors, meteorological parameters, traffic data, and any assumptions used in the modeling. The CO maxima site selection/intersections selection process should be described and documented. Background concentrations used should be documented. The traffic data source should be cited and projection techniques used to project the traffic should be documented. The results should be presented in an easy to read table.
6. Construction Emission Analysis - Describe standard measures of the VDOT Road and Bridge Specifications; discuss any important impacts that may occur and any special measures beyond the Specifications proposed to minimize harm. Examine land-use features and facilities adjacent to the proposed project that may be particularly sensitive or notably impacted. Identify any locations where the degree of potential impact would be inconsistent with the specific feature or facility (i.e. ventilation or air conditioning intakes situated next to road which services tunnels or medical/health facilities, etc.).
7. Mitigation – If required, describe any required mitigation measures for operational or construction emissions.

8. Conformity - In existing non-attainment or maintenance areas, assess the regional conformity status of the project with respect to the federally approved Transportation Plan, and State Transportation Improvement Program or Transportation Improvement Program (Plan and Program). State if the project is exempt from regional transportation conformity requirements. For regionally significant projects, identify whether the project is included in the Plan and Program, and whether the schedule, design concept and scope (completion date, termini, number and type of lanes, etc) are correctly documented in the Plan and Program. The document should identify the dates or fiscal years of the Plan and Program that include the project. If the project is not correctly included in a Plan and Program, then discuss the arrangements that have been made to include the project in a future update of the Plan and Program. In proposed non-attainment areas, discuss arrangements to have the project included in the Plan and Program and evaluated for regional conformity. The review and evaluation of regional air quality should only be done through the transportation conformity and State Implementation Planning processes. A final environmental document (final CE, FONSI, FEIS) may not be approved unless the project meets transportation conformity requirements of 40CFR93.

9. Conclusion - Summarize the CO analysis and its findings relative to the National Ambient Air Quality Standards (NAAQS) levels. Summarize any construction impacts, and discuss the construction specifications and any special construction mitigation measure. Summarize the area's attainment, non-attainment or maintenance status. State whether the project is expected to interfere with the attainment or maintenance of the NAAQS.

5.3 Incorporation Into Environmental Documents

In environmental document texts (CE, EIS, FONSI, etc.), provide summary paragraphs pertaining to the air quality findings that suit the context of the various environmental document sections. These should use the summary from the appropriate multi-alternative or selected alternative technical report, and refer readers to the technical report for additional detail. For 4(f) or 106 documentation, however, discussion should refer to any 4(f) or 106 sites that were modeled, or were represented by other sites in the CO analyses. Assure that the appropriate agencies (VDEQ, EPA and any others) are considered for solicitation of comments and are present on any distribution list. For EIS work, identify the personnel that performed the air quality work. Assure that responses are provided to review comments received from the public and review agencies.

5.4 Record Keeping

Copies of the air quality reports and portions of environmental texts must be provided to VDOT in electronic format for preliminary review and file reference. Copies of all CO/site analyses' input and output data (CAL3QHC, etc.) also must be forwarded to the VDOT Environmental Division for confirmation and retention in the Division's Project Files. The Consultant is also required to maintain his own copies of the plans, traffic, air quality reports and documentation in accordance with the contract.

Any questions or comments about the guidance provide in this document can be directed to VDOT Environmental Division Air Quality Section personnel. Current Environmental Division Air Quality Section contacts for questions about Air Quality Project Level Analysis:

Richmond and Northern Virginia Non-Attainment Areas

Amy Costello
Air Quality Program Manager
E-mail: Amy.Costello@VirginiaDOT.org
Direct Line: (804) 371-6773

Hampton Roads Non-Attainment Area

Douglas Landwehr
Air Quality Meteorologist
E-mail: Douglas.Landwehr@VirginiaDOT.org
Direct Line: (804) 371-6764

Other Areas of Virginia

Amy Costello
Air Quality Program Manager
E-mail: Amy.Costello@VirginiaDOT.org
Direct Line: (804) 371-6773

Douglas Landwehr
Air Quality Meteorologist
E-mail: Douglas.Landwehr@VirginiaDOT.org
Direct Line: (804) 371-6764

Mailing Address:

VDOT Environmental Division; Air Quality, Noise and Energy Section
1401 E. Broad St., Hospital Building
Richmond, VA. 23219

APPENDIX 1

Example Worksheets for Consultant Proposals

See Section 2

I) AIR QUALITY SUB-TASKS & PERSONNEL HOURS

DETAILED SUB-TASK	PLANNER	MANAGER	SPECIALIST	DATA TECH	TYPIST
1. Plan & traffic review, CO sites selection, and 1 & 8hr CO analysis					
1A. Site Selection (reasonable CO maxima sites)					
1B Detailed Analyses (CAL3QHC/Mobile6.2)					
2. CO Backgrounds (usually use default estimates)					
Existing					
Future					
3. Construction Impacts					
4. Evaluate Results					
5. Prepare Tech. Report					
6. Prepare Draft &/or Final Document Texts					
7. Rev./Public Hearing Comment Responses					
8. Management/Work Coordination, etc.					
9. Total Hours					
10. Salaried Costs (Hrs x Hourly rate)					
11. Total Salaried Cost for Air					

II) SALARY HOURLY RATES

Position	Hourly Rates	Name of Person
Manager		
Air Planner		
Air Specialist		
Typist		
Typing Pool		

III). DIRECT COSTS

Also list, detail and total the direct cost items and expenses to be charged with respect to the air quality work. Itemize information and costs for travel events (transportation modes, meals & lodging including number of persons and number and type of occasions such as site visits, project meetings and hearing(s)). Also itemize expenses for telephone or fax, special computer/software needs, and printing and mailing (reproduction and distribution of quantities and sizes of documents). Also itemize and detail any work involving sub-contract consultants.

IV) TIMELINES & SCHEDULES

Identify a specific schedule or definite dates for completion of key work tasks. For example:

1) Draft Stage Reviews:

   The consultant ensures that VDOT will receive preliminary draft technical air quality reports for review by mm/dd/yyy. VDOT will receive preliminary copies of the draft environmental document sections for review by mm/dd/yyy.

2) Draft Stage Signature copies:

   All air reports and related documents for the draft document stage will be readied by the consultant and received by VDOT on or before mm/dd/yyyy.

3) Final Stage Reviews:

   The consultant ensures that VDOT will receive preliminary final technical air quality reports for review by mm/dd/yyy. VDOT will receive preliminary copies of the final environmental document sections for review by mm/dd/yyyy.

4) Final Stage Signature copies

All air reports and related documents for the final document stage will readied by the consultant and received by VDOT on or before mm/dd/yyyy.

APPENDIX 2

Virginia Non-attainment and Maintenance Areas 2003

***Classifications will be updated April 2004.

Non-attainment Area - An area that exceeds the Environmental Protection Agency's national ambient air quality standard (NAAQS) for a critical pollutant including ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen dioxide or lead.

Maintenance Area – An area that previously exceeded the EPA's NAAQS for a critical pollutant that must continue to implement procedures to assure continued air quality improvements.

The below air quality jurisdictions can be found on the following Virginia legislative websites: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-20-204 and http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-20-203

Northern Virginia Ozone Nonattainment Area:

Arlington County	Alexandria City
Fairfax County	Fairfax City
Loudoun County	Fall Church City
Prince William County	Manassas City
Stafford County	Manassas Park City

Richmond Ozone Maintenance Area:

Charles City County* Colonial Heights City

Chesterfield County	Hopewell City
Hanover County	Richmond City
Henrico County	

* Beginning at the intersection of State Route 156 and the Henrico/Charles City County Line, proceeding south along State Route 5/156 to the intersection with State Route 106/156, proceeding south along 106/156 to the intersection with Prince George /Charles City County line, proceeding along the Prince George /Charles City County line to the intersection with the Chesterfield/Charles City County line, proceeding north along the Chesterfield/Charles City County line to the intersection with the Henrico/Charles City County line, proceeding north along the Henrico/Charles City County line to State Route 156.

Hampton Roads Ozone Maintenance Area:

James City County
York County
Chesapeake City
Hampton City
Newport News City
Norfolk City
Poquoson City
Portsmouth City
Suffolk City
Virginia Beach City
Williamsburg City

NOVA Carbon Monoxide Maintenance Area:
Arlington County
City of Alexandria

APPENDIX 3

Reference Documents and Further Information

Discussion on "The appropriate level of air quality analysis."

http://environment.fhwa.dot.gov/guidebook/vol1/doc1r.pdf

Guidance for preparing and processing environmental and Section 4(f) documents.

http://environment.fhwa.dot.gov/guidebook/vol2/doc7i.pdf

Discussion of the different standards and concerns that apply to highway tunnels

http://environment.fhwa.dot.gov/guidebook/vol1/doc1q.pdf

National Ambient Air Quality Standards

http://www.epa.gov/air/criteria.html